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ABSTRACT

This report summarizes North Central Mathematics and Science Consortium (NCMSC), previously known as the Midwest Mathematics and Science Consortium (MSC), previously known as the Midwest Mathematics and Science Consortium (MSC), outcomes over a 5-year period. The outcomes of activities designed to meet six objectives are described. Objectives include collaboration with teachers, administrators, and professional organizations; implementation of a process to identify high-impact, high-priority projects; provision of training and technical assistance to teachers and administrators; and promotion of exemplary and informal educational resources. (MM)

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Midwest Mathematics and Science Consortium[1] Final Grant Report: 1995-2000

Introduction

ED 458 121

The North Central Mathematics and Science Consortium (NCMSC)—previously known as the Midwest Mathematics and Science Consortium or MSC—has completed its eighth year of operation. By all accounts, this successful organization is held in high esteem by the clients it serves in Illinois, Iowa, Indiana, Ohio, Michigan, Minnesota, and Wisconsin. One of the best indicators of its success is that no organization chose to compete with MSC in either 1995 or 2000 because crucial clients, such as state departments, were not interested in supporting any other organizations.

However, the picture was not always so positive. In 1992 and early 1993, sentiment about the MSC was so negative that state representatives and professional organizations asked the U.S. Department of Education to terminate the grant. NCREL responded by hiring a new MSC director and staff, and that staff submitted a new proposal built on actual client needs. By 1994, MSC had become a highly respected and valuable partner in the effort to improve mathematics and science education for all students in the North Central Region.

It is important to note the differences between the 1992 and 1993 grant designs both because these changes both illustrate needs in our region and defined the niches that MSC successfully fulfilled after 1993. The 1992 proposal focused on providing workshops on multicultural and equity themes targeted to urban and rural settings. Those topics were and continue to be important, but the original design failed to recognize that these topics must be addressed within a context of other state and district reform efforts. The 1993 grant focused on systemic reform that attended to needs defined from data and targeted to national, state, and district standards, improvement initiatives, and ongoing systemic efforts.

The 1992 and 1993 grant designs differed from each other in that the earlier grant had MSC scheduling and MSC staff presenting those workshops. The 1993 design focused on creating materials and tools that existing infrastructures—such as state department staff, intermediate organizations, district coalitions or professional organizations—would be trained to use, and they became the principal disseminators to teachers. The 1992 and 1993 designs were quite different in the role they gave technology. The 1992 design had no technology emphasis, while the 1993 design indicated that given the large number of schools (25,000), huge population (19% of U.S. students), vast geographic area (seven states), and diverse needs of the region, MSC would use technology in cutting-edge ways to build better products and assist in dissemination.

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[1] During the 1995-2000 grant, the consortium was called the Midwest Mathematics and Science Consortium (MSC). Therefore, throughout this report, the consortium is referred to by this name. The name since has been changed to the North Central Mathematics and Science Consortium (NCMSC), which is the name applicable for the 2000-2005 grant.

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The 1992 and 1993 designs differed in how they created products. The 1992 design had MSC develop products for districts based on research. The 1993 design products were built on the best research as well; however, the 1993 design also called for all products to be codeveloped with practitioners, often at intensive service sites where districts were comfortable with MSC's researching the success of those products for both teachers and students. The idea was that products would be more valuable if they reflect real needs and solutions developed from actual practice situations.

Broad-Based Lessons Learned

We've noted the changes made between the 1992 and the 1993 versions of the MSC proposals and how those changes saved the MSC. In this section we will focus on what we've learned since 1995 that we have incorporated into our 2000 proposal. The following principles will guide us to be even more successful in the next five years.

- Our work is about student learning. Research-based professional development focused on engaged student learning can result in improved learning for all students.

- We should not try to be all things to all people. We need to determine niches and be extremely proficient in them. In areas where we lack expertise, we need to be prepared to refer clients to others who can help.

- We need to recognize that not all our relationships can be intensive. However, if designed well and sufficiently linked to collaborative partners, our work can reach all mathematics and science teachers.

- We need to understand that some of our best work involves our connecting people to one another. We don't need to be involved in everything.

- We need to understand that the professional development component for proper use of a product is as important as the product itself. Before designing a product, significant consideration must be given to how it will be disseminated, integrated, and modeled for use within existing work.

- We need to understand that intensive relationships with schools, school districts, states and regional entities must be designed as long-term with shared responsibility for failures and successes. Success needs to be win-win for both organizations, and both parties must accept that the failure of either is lose-lose for both.

The principles noted above became our expectations and operating standards for how MSC should meet its implied contract with mathematics and science leaders and professional development providers in our seven states. Obviously, MSC staff were careful to respond to the conditions noted in the "Request For Proposals," but we always honored the operating principles that have given MSC a valued niche in mathematics and science educational improvement.

We've paid attention to lessons learned and tried to benefit from them. What follows is our report of the past five years of operation.

The authorizing statues for the regional mathematics and science education consortia specified two purposes: (1) dissemination of exemplary mathematics and science education materials, and (2) delivery of technical assistance for the implementation of teaching methods and assessment tools for use by elementary- and secondary-school students, teachers, and administrators. To satisfy those purposes and advance the systemic reform of mathematics and science education for all students in its region, MSC developed six objectives, which correspond to the priorities listed in the Notice Inviting Applications for New Awards for fiscal year 1995.

MSC Objectives

MSC collaborates, coordinates, networks, and links with partners throughout the region, including state departments of education, intermediate units, and other programs that are interested in systemic improvement of mathematics, science, and technology. To advance the systemic reform of mathematics and science education, MSC set out to accomplish the following six objectives:

1. MSC will facilitate and engage in collaborative efforts with teachers, administrators, and professional organizations to build capacity and leverage resources to achieve the outcome of systemic reform of mathematics and science education throughout the region.

2. MSC will establish and implement a process to identify high-impact, high-priority projects, products, and services that respond to the needs of our collaborative partners. MSC will develop relationships with two or three "intensive" sites in each state to collaboratively research and develop materials and processes that support improved student-learning strategies and achievement.

3. MSC will provide training and technical assistance to teachers, administrators, and other educators that will enable them to improve teaching and learning in mathematics and science continually. Special emphasis will be placed on the use of technology.

4. MSC will work through the National Organization Task Force on Informal Education, energy labs, museums, and other informal education entities to promote the increased use of informal educational resources.

5. MSC will work through its collaborative regional networks, other consortia, and the Eisenhower National Clearinghouse to identify and describe exemplary resources and best instructional practices.

6. MSC will initiate evaluation and data collection related to intended outcomes to determine the effectiveness and impact of consortium activities in districts selected for intensive partnerships.

Description of Project Accomplishments by Objective

OBJECTIVE 1: MSC will facilitate and engage in collaborative efforts with teachers, administrators, and professional organizations to build capacity and leverage resources to achieve the outcome of systemic reform of mathematics and science education.

This objective was accomplished by producing a number of various products in collaboration with different partners. Each product described below was developed to meet field needs we identified with our collaborative partners. Although some initially were developed for a particular state or location, these products have been designed to address regional and national needs. In all cases, as stated in each product summary, requests for the products and dissemination have been widespread, often extending beyond our region. Early in the grant, product development was print-based; however, with technological advances—both in access and production costs—our products have become almost exclusively electronic, such as CD-ROMs, Web sites, and PDF files.

"Learning Through Technology" Web Site

At the request of the Illinois Board of Education and the Illinois Technology Advisory committee, MSC created technology indicators and a Web site that modeled learning through technology. The site was built to illustrate all necessary components for effective use of technology—including needs assessments; using technology to improve student learning in mathematics and science; and assessing student success, teacher comfort, and community involvement—to determine how to improve future efforts. This site also was built to illustrate the technology indicators with actual examples taken from the demonstration sites funded by the Illinois Department of Education. The site was completed by its deadline three years ago, and a modified version of the site continues to get 1,400 hits a week. A site, which can be accessed through a link on the NCREL home page, has his URL: http://www.ncrel.org/tandl/homepg.htm.

The site received several awards, including two that listed the site as one of the top 12 sites schools should use when planning for technology and the appropriate integration of content. Several states used the technology learning indicators to determine grant recipients. The state of Illinois and many school districts in other states used this site as a major component of their professional development curriculum. In its first year, it was NCREL's second-most popular site as measured by number of hits.

The most important outcome is that users of this Web site learned technology's value: The site empowered teachers and learners and was not seen as something to be used in isolation. This site in combination with the exemplary-units Web site (a collaborative effort of Fermi Lederman Science Center and MSC that is further described under Objective 4), have given mathematics and science teachers tools to use technology more effectively and provided ways to enrich make mathematics and science more relevant for students by showing them real-world connections of those disciplines. Many surveys suggest that the NCREL and MSC region is a, if not the, leader in quality use of technology in education.

Mathematics Problem-Solving Cases Project

The Mathematics and Science Consortium staff worked with 12 teachers in K-12 classrooms to develop a professional development resource book of teacher-authored cases of mathematical problem-solving teaching and learning. In all, 25 cases were developed and piloted with different groups of teachers through a series of case discussions, which introduced case discussions and case writing as an effective form of professional development. Some cases were integrated into our intensive site work in Detroit and Hammond as well as in developing our Blueprints CD-ROM. The feedback indicates that case discussions are positively received as a professional development opportunity.

Science T.R.E.E.

The Science T.R.E.E. (Teachers Reaching Educational Excellence) CD-ROM and facilitator guide answers a need identified by the Educational Service Agencies in the MSC region. Employees of those agencies in all seven states joined teachers from the region and MSC staff to design this elementary science instructional design tool. Distribution of the final CD-ROM and Facilitator Guide began in February 2000.

The CD-ROM enables elementary teachers, preservice teacher candidates, and/or curriculum designers to plan elementary units and investigations using one of five templates. The template modules are accompanied by questions that link to a vast array of information resources (foundation areas). By linking to standards and best practices, the questions and foundation areas provide an embedded professional development component as well.

The CD-ROM is designed to enable users to document the use of national, state and/or district standards in their curriculum planning. Users also can combine investigations to form units and combine units to form a grade-level curriculum plan. The charge was to develop a tool that fostered increased student achievement in science by enabling elementary teachers to plan high-quality, standards-based science investigations, units, and curricula, while learning about science content, pedagogy, and assessment. Follow-up surveys and unsolicited responses indicate a high degree of satisfaction with the product, with requests for the product coming from as far as Hawaii and Alaska.

Connecting With the Learner—An Equity Toolkit

Connecting With The Learner (CWL), An Equity Toolkit was a collaborative project involving MSC and the Michigan Department of Education (MDE). The toolkit represents the combined efforts of the Michigan Statewide Systemic Initiative (MSSI), MSC, NCREL, and Michigan teachers and university administrators. This toolkit is an integral part of MDE's mathematics and science state framework.

The 600-page document addresses six issues: (1) examining beliefs and defining equity, (2) designing equitable curriculum, (3) linking teaching with learning, (4) exploring instructional strategies, (5) building on successful model programs, and (6) partnering with families and the

community. Two critical themes are embedded throughout the toolkit: Using a systemic approach to change, and ensuring equitable access to and achievement in mathematics and science.

MSC's initial role in this project was to assist in developing and piloting the toolkit with MSSI teams and state mathematics and science centers. Feedback also was sought from key national organizations.

Following the completion of the toolkit in 1999, MSC worked with the Michigan Equity Task Force on its dissemination. Initially, MDE purchased 1,500 copies of the toolkit, which were distributed to every educator, parent, and community member who expressed an interest in equity in mathematics and science education. Dissemination has been in the context of professional learning communities.

MSC has been instrumental in building awareness and disseminating the toolkit to other educators in the region and nationally. The toolkit was presented at the annual conferences of the Michigan Science Teachers Association (MSTA) and the National Science Teachers Association (NSTA). The toolkit was used as one of the five focus areas for the Chicago Systemic Initiative 1998 summer institute; it was the focus of one workshop and distributed at the cross-consortium meeting in Sante Fe, and it has been highlighted, distributed, and used by the Cohort 6 team of the Equity in Mathematics Education Leadership Institute, directed by Julian Weissglass at the University of California at Santa Barbara.

MSC staff also has supported the CWL Design Team in evaluating the CWL learning communities. Follow-up evaluation surveys found a high percentage of participants were highly satisfied with the CWL learning communities and the toolkit. Almost all indicated that it increased their knowledge and awareness of equity; nine in 10 respondents found the content to be relevant to their professional practice. Participants primarily have applied the concepts and activities from CWL through sharing with other colleagues either formally (workshops) or informally (sharing handouts, discussions). Other individuals said they have changed their classroom activities and assessments to reflect their new knowledge.

MSC will continue to provide support to the CWL Design Team and incorporate the toolkit into their work in the next grant.

Changing Perspectives

The Changing Perspectives CD-ROM and Resource Package includes a 700-page resource manual, a videotape, five audiotapes, and a facilitator guide. The Changing Perspectives package uses the interactive capabilities of the CD-ROM to enable site-based learning communities to meet during a period of time to plan for change and form collaborative relationships to better assess student needs. One goal of this package of innovative materials is to open the planning process in schools so that the entire educational community—including parents, businesspeople, community members, staff, and students—is involved in a substantive way in planning for change and setting high standards. Topics covered include strategic processes, resources, learning communities, strategies for change, equity and diversity, learning environments, learning,

assessment, systems, and creating the vision. This product was completed, produced, and shipped in September 2000 to the more than 750 colleagues who have attended trainings during the last four-and-one-half years. These colleagues piloted all portions of the package at various times during the production phase. The facilitator guide was developed by outside consultants in concert with information received from those piloting the materials. Approximately 15 awareness trainings have taken place throughout the region and nation.

Family of Learners Resource Guide

The Family of Learners Resource Guide and CD-ROM was developed in collaboration with Wisconsin Cooperative Service Agency (CESA) #11 staff, along with teachers and students across Northwestern Wisconsin. Though much research supported the need for and effectiveness of parent involvement in a child's education, MSC did not have a product or service model for schools or districts that identified parental involvement needs. Our work with CESA #11 in Wisconsin with Changing Perspectives provided entry into a collaborative effort that reflects 10 years of work in the area of parent involvement by the school districts in this part of Wisconsin.

Family of Learners Resource Guide is a compilation of information, research, landmark articles, and activities for educators, parents, and community members as they work together to positively affect student learning. This product is intended to be used by educators and parents to increase parent and community involvement in the education of the children. Users can print more than 2,000 pages of resources, but all permissions for reproduction were retained by NCREL. Distribution of the final CD-ROM began in late September 2000, and requests for copies have been tremendous.

The Family of Learners Resource Guide promises to serve the parent-involvement priorities of our Urban Systemic Initiative districts as well as those of school districts striving to address the priorities identified in Title 1 and Goals 2000 legislation. In addition, the guide is designed to combine practices that have worked in schools with the research and best-practice information that supports those practices.

PCIIM

The PCIIM (Promising Curricular and Instructional Improvement Materials) project is a collaborative project with Fermilab's Lederman Science Center. All the recent NSF-funded K-12 curriculum materials in mathematics and science, along with many other exemplary curricular materials, have been obtained through donations or purchases. The collection of more than 65 science and mathematics curriculum projects for grades K-12 are housed on the shelves of the Fermi Lederman Science Center in Batavia, Ill. These materials are available for day-to-day use by visiting educators and transported to curriculum showcases throughout our region. The collection is continually reviewed and updated. Although the PCIIM collection is worth tens of thousands of dollars, its real value lies in its many collaborative uses. The project continues to be a flagship of our work in the areas of standards-based curriculum framework development and materials pilots, adoptions, and implementation.

In the last three years, MSC transported the Curriculum Showcase to 10 sites in six of our seven states (Wisconsin Rapids School District, Iowa Governor's Conference, Iowa Area Education Agency #5, Wisconsin Leadership Conference, Minnesota State Science Best Practice Network meeting, CESA #11, Project REAL (Ohio), Harvey School District (Illinois), Waukegan School District (Illinois), and the Minnesota Curriculum Showcase (co-sponsored by SciMathMN, the Minnesota Department of Children, Families, and Learning, and NCREL/MSC). In addition, the showcase was a part of two educational tour packages for the National Council of Teachers of Mathematics (NCTM) 2000, in collaboration with the Lederman Science Center and Fermi National Accelerator Laboratory.

These materials already are scheduled to be the centerpiece for curriculum showcases in Illinois, Wisconsin, and Minnesota during the summer of 2001, with more requests pending. Surveys distributed to participants indicate high degrees of satisfaction and, as a result, have enabled MSC to add projects based on participant recommendations.

EdSTAR Minnesota Web Site

The EdSTAR (Educational Standards, Technology, Applications and Research) Minnesota Web site (http://edstar.ncrel.org/mn) is a collaborative effort with the Minnesota Department of Children, Families and Learning, NCREL, SciMath MN and the Minnesota Council of Teachers of English, as well as teachers throughout the state. Originally a development project called Gateways that was started in 1996, EdSTAR MN is a comprehensive Web site for teachers that provides substantive help, direction, and professional development in the area of Minnesota State Standards implementation. The site reflects current research in content, pedagogy, and assessment. Curriculum, video/audio, software and Web resources, which have been reviewed and submitted by educators in our region, are linked to content and grade-level key student understandings. The first four content areas were posted in September 2000, with two more areas to be added in December 2000 and the entire site to be completed in 2001. The site is serving as a structural prototype for similar sites in other states in our region: Work already has begun on an EdSTAR Ohio site and initial talks have begun with Michigan, Wisconsin, and Indiana.

Ohio Math and Science Coalition

MSC planned and facilitated a two-day needs assessment at the Ohio Math and Science Coalition (OMSC) meeting in November 1999. The colloquium brought together about two dozen science and math teachers (all of whom are either Presidential award winners or certified by the national board), as well as about 15 other educators, such as administrators and representatives from the state department of education. Using a number of interactive processes from the Blueprints CD-ROM, OMSC, MSC, and NCREL staff members could facilitate data gathering and group collaboration that enabled project-goals completion. Data gathered from that meeting of teachers, university educators, state personnel, and business and community leaders resulted in many reports and recommendations for action shared throughout the state and with the state superintendent. These reports have served as planning aids as Ohio leaders look at long-range mathematics and science initiatives.

OBJECTIVE 2: MSC will establish and implement a process to identify high-impact, high-priority projects, products, and services that respond to the needs of our collaborative partners. MSC will develop relationships with two or three "intensive" sites in each state to collaboratively research and develop materials and processes that support improved student-learning strategies and achievement.

MSC has partnered with intensive sites within our seven-state region. Our Advisory Board and State Teams guide the identification of those intensive sites; the site itself, along with MSC staff, determines the major focus of work, based on needs assessment. Our work with intensive sites will continue into the next grant period.

Advisory Board and State Teams

The Mathematics and Science Consortium Advisory Board and State Teams are two major sources that guide and help determine our scope of work within the region. Annual meetings are held with both groups, and email communication takes place throughout the year. We have an excellent relationship with both groups, as evidenced by the high degree of participation in planned meetings and the communication we receive. The Advisory Board is designed to represent a wide continuum of individuals, including teachers and business and community representatives. The State Teams are made up of technical-assistance providers from each state, ranging from state departments, intermediate organizations, professional organizations, staff developers, district office staff, and teachers. Both groups value our work and want us to continue producing research-based products and linking research to the classroom. They especially are interested in products that support their professional development efforts and in the networking opportunities that allow states and districts to learn from one another.

Intensive Sites

In each state, MSC developed relationships with two or three "intensive" sites to collaboratively research and develop materials and processes that supported improved student-learning strategies and achievement. These locations are where most of MSC's products originated through technical and codevelopment activities. We took great care in choosing these sites to ensure meaningful collaborative research and development directed toward systemic reform. Using information gathered through existing networks and contacts, we identified two or three sites in each state. These sites were individual schools, school districts, or cooperative groups of school districts working to achieve a well-defined purpose. The relationships were intended to be long-term, supported by a significant commitment of time and resources by intensive site partners, and capable of producing products and/or research that can be disseminated and implemented in other locations. What follows is a description of each site with which we have worked intensively during at least two of the five years.

Illinois

Chicago Systemic Initiative

The work in the Chicago Public Schools was framed by three efforts. The first was developing a working relationship with the Chicago Urban Systemic Initiative (CSI), which ultimately led to an MSC staff member joining the CSI Board. MSC then was invited to become more involved with CSI by providing leadership and professional development training to the 12 mathematics and science facilitators who service the CSI's six regions. MSC staff has devoted significant time in planning and leading the Summer Institutes as well as providing professional development training to these facilitators throughout the school year.

The second effort in Chicago has been a partnership with NCREL's "Every Child Can Succeed" program, which helps probationary schools raise their academic standards. Schools are placed on probation when fewer than 15 percent of the school's students meet or exceed the grade-level norm on the Iowa Test of Basic Skills. MSC provided technical assistance and training in mathematics and science to four high schools.

The third MSC effort in Chicago has involved working with individual schools that contacted us seeking individual or specialized help. One school we gave intensive assistance was McCorkle Elementary School, located in the heart of the Robert Taylor homes. Prior to relationship with McCorkle, the CEO of Chicago Public Schools had informed McCorkle that the school would close at the end of the year because it had made no gains in reading or mathematics in four years. MSC staff worked diligently with the McCorkle staff to reform their mathematics curriculum, and the school's mathematics scores tripled. Students scoring at or above the national norm increased from five percent to 36 percent.

First in the World Consortium

MSC and NCREL have partnered with the First in the World Consortium (FITW) in several ways. MSC staff helped FITW develop teacher learning networks, which consists of groups of educators from the 20 Chicago North Shore suburban school districts that comprise FITW. These educators have committed at least one day a month to work and learn together. Each of the four networks has a specific focus: curriculum standards, models of instruction, assessment, and technology. From these specific perspectives, the networks work to find ways to ensure that all students excel in mathematics and science. MSC staff helped teacher-facilitators organize the network meetings to promote learning and growth. They also provided resources and documented the process of the meetings. The teacher learning networks continue to be active and supported by FITW leadership; however, MSC staff is no longer actively involved.

The second major initiative with FITW was in the analysis of its TIMSS data. A partnership was formed with the U.S. TIMSS National Research Center at Michigan State University and FITW. With the consent of the U.S. Department of Education, TIMSS results from fourth- and eight-grade students in the FITW were permitted to represent those of an independent "nation." FITW received a multitude of data as a result, but it had little direction regarding how to proceed.

NCREL, in partnership with the U.S. TIMSS National Research Center, provided guidance by administering the General Topic Trace MAP (GTTM), analyzing the data, and lending technical assistance. MSC and NCREL aimed to understand the specific needs of practitioners as they used these data as part of local school improvement processes.

MSC and NCREL worked with FITW to create a Web site documenting the spectacular successes of these school districts. This site allows FITW and MSC to communicate the many things they have learned as the result of their work and collaboration. The Web site is focused on information about the purpose and history of the FITW, student results, curriculum analysis, questionnaire analysis, and student and teacher resources. The Web site was originally housed on the NCREL server, but it recently has been moved to: http://www.1stintheworld.org.

Indiana

Anderson

Our relationship with Anderson grew out of its Challenge Grant. Originally, MSC staff and Anderson district staff thought our work would develop into an intensive relationship. However, after many planning meetings and discussions, it was decided that MSC staff would better serve Anderson by providing technical assistance to Anderson central office staff. Accomplishments include examining the existing mathematics and science curriculum to make informed decisions about textbook selection, planning for professional development, and implementing new materials. During the past four years our work with Anderson has changed: Anderson now is part of our extensive work for the new grant period. We are working with central office staff by providing resources and technical assistance on an as-needed basis.

School City of Hammond

NCMSC staff has provided technical assistance to School City of Hammond staff in the area of mathematics reform since the 1997-1998 school year. Based on state assessment data, the targets of the K-5 professional development initiative were mathematics processes, problem solving, communication, and reasoning. MSC staff designed a research-based professional development initiative, Problem-Solving and Critical Thinking in Mathematics (PSCTM), to support and improve teacher and student learning in those four areas. Approximately 125 teachers and principals in 11 of the 16 elementary schools have participated in the initiative, which entailed three days of initial training with four follow-up sessions held throughout the school year. After the initial training days, teachers participated in model lessons with pre- and post-discussion and reflection conducted by MSC staff, for the purpose of observing firsthand how to integrate problem-solving and critical thinking into a daily mathematics lesson. Team 1 teachers taught the model lessons during the second and third year of the initiative with support from MSC staff. Administrators and teachers universally have indicated that the model lesson component has been the turning point for the teachers, and this has been further supported in the evaluation findings. Team 1 teachers also participated in a curriculum-development summer project as phase II of this PSCTM initiative. During phase II, Team 1 teachers designed and sequenced lessons at each grade level, K-5, for a comprehensive and interdisciplinary curriculum project.

A comprehensive evaluation of this initiative was conducted in the 1999-2000 school year. A complete copy of the evaluation is included in the appendix. This evaluation effort is just the first of a series of planned evaluations to gather data that facilitates district and building-level, data-driven decision making, and to provide MSC with information that will enable us to serve Hammond and other districts better. Hammond will continue to be an intensive site for the next five years. Future goals for Hammond include meeting with staff from the Leadership Academy to map out a professional development plan for 2001-2005, designing a long-term plan for K-8 mathematics reform, and determining a mechanism to assess these efforts.

In addition to the professional development provided by MSC staff in the PSCTM initiative, MSC staff also provided evaluation assistance for Hammond's Class Size Reduction (CSR) Evaluation. Semi-structured interviews were conducted by MSC staff with all participating first- and second-grade teachers, building level principals, and central office staff. MSC staff also assisted in the analysis of assessment data for the CSR project.

Iowa

AEA #2, Clear Lake

The AEA #2 collaboration (1997-98) focused on 18 middle schools in the Clear Lake, Iowa, area that were part of a Star Schools grant. The purpose of the project was to develop curriculum integrating technology with mathematics and science at the middle school. MSC staff—in collaboration with the University of Northern Iowa and AEA #2, and with the help of Fermilab, the NASCO Company, Fort Atkinson School District in Wisconsin, the Wisconsin Department of Public Instruction, and NCREL—cosponsored a two-day conference so that teams could explore and examine, with discussion and planning time built in, technology resources that would best support their mathematics and science curriculum. MSC also provided AEA #2 with a set of core resource materials in curriculum development, as well as sets of middle school curriculum materials to help teams through the development process.

Projects RISE and ISEE

Project RISE (Regional Implementation of Standards in Education) and ISEE (Integrating Science and Special Education) were funded through an Eisenhower grant received by the University of Iowa's Science Education Department. MSC's role has been to build internal capacity and leadership in a number of Iowa school districts by working with groups of emerging teacher leaders. MSC provided assistance in facilitation skills, professional development design, and leadership. Teacher leaders were introduced to new professional development strategies, such as case study and action research. As evidence of effectiveness, RISE has been annually refunded by Eisenhower Higher Education grants. In addition, a number of teacher leader participants entered graduate education studies at the University of Iowa. Some of the early teacher leaders now serve on the project's management team.

Michigan

Detroit Urban Systemic Initiative

MSC supported the Detroit Urban System Initiative (DUSI) through their assistance in four areas. MSC staff worked with principals on the new vision of professional development and how they could support the professional growth of teachers in their buildings. MSC staff provided summer leadership institutes and they facilitated monthly follow-up sessions (Administrators' Learning Community) throughout the school year.

A second aspect of MSC's work with DUSI entailed working with 12 individual school staffs on specific science and math related initiatives. The work ranged from supporting whole school reform and school improvement efforts to demonstration teaching in selected classrooms.

The third initiative involved working with teams of approximately 40 teachers on creating integrated curriculum units. Standards-based integrated curriculum units that aligned with the DPS curriculum were created and field-tested.

MSC staff facilitated the Central Office Mathematics and Science Curriculum Staff Learning Community. The goal of the learning community was to enhance the capacity of these individuals to support school-based professional development.

MSC's work with DUSI built the capacity of a diverse group of stakeholders to support systemic reform of math and science education in Detroit. During and following the MSC's work it, DUSI was consistently rated as one of the top performing USIs and was one of a few USIs refunded by NSF for an additional five years.

Michigan Statewide Systemic Initiative

MSC worked with the Michigan Statewide Systemic Initiative (MSSI) at three levels. At the first level, MSC provided consultation and facilitation to the management team on strategic planning and project design. Second, MSC worked directly with the MSSI's Professional Development Coordinators in the design and implementation of their work with Michigan's professional development community. At the third level, MSC provided direct service to MSSI focus district teams.

NSF's external evaluators highlighted MSSI's professional development component as an example of effective systemic change in a professional development system. The MSSI management team sought the assistance of the MSC at critical junctures of the initiatives evolution. MSC's work has supported Michigan's national leadership in standards-based mathematics and science reform.

When funding ceased in 1997, we worked to find ways to maintain several important aspects of the MSSI mission. For example, we continue supporting the work of the Mathematics and

Science Centers as well as the Michigan Mathematics and Science Alliance (MiSMA). Both of these initiatives are highlighted in Objective 3.

Ohio

Project REAL

Project REAL is composed of six school districts selected to participate in the project because of their high poverty levels and because they have been classified as academic emergency or academic watch schools. Four of the districts met seven or fewer of the 35 academic standards designated by the Ohio Department of Education. Five of the six are located in Appalachia and the other is a rural district in south central Ohio. The six school districts have a total enrollment of about 12,250 students and 850 teachers, and almost all teachers and students are white. Most of the districts cover very large geographic areas located in mountainous areas that, though beautiful, make transportation difficult. The people who live there have great pride in their communities, and many students indicated a desire to live their adult lives in those same locations. It is not unusual to find two generations of teachers from the same family in the same school district.

MSC's initial work has focused on analysis of a great deal of assessment information that revealed very serious alignment issues between the Ohio Proficiency Test, which serves as the primary measure of accountability, and the curriculum materials and instruction provided in most of the Project REAL schools. The analysis showed that the materials and instructional strategies used in most schools covered only three of the seven areas emphasized in the Ohio Proficiency assessment.

We have developed a meaningful and positive relationship that has moved from hostility and suspicion to a learning community that is successful, functional, and optimistic. Project REAL, though only a year and a half old, is already a highly successful partnership with Miami of Ohio-Ironton, the Ohio Department of Education, the six school districts, and MSC. The Ohio Department of Education through a proposal written by Miami of Ohio-Ironton has committed significant funds for Project REAL and considerable staff development has been provided for mathematics and science teachers in Grades 4 to 12.

Planned MSC work in the next three years includes assisting teaching educators make curriculum and instructional decisions based upon data. In the summer of 2000, 75 middle school teachers were trained on FAST and FOSS Science and Connected Mathematics, and 93 teachers participated in a five-day workshop that focused on developing expertise on using data to determine student needs and the use of supplementary units to address those needs. Two follow-up sessions to the future work will address change processes, working with adult learners in professional development settings, and implementing successful school reform.

MSC also has responsibility for the quantitative evaluation of Project REAL. This project is significant to our research agenda because it is one of the few areas undergoing significant research-based reform that has high levels of poverty and sufficient stability of population to allow

longitudinal analysis. External evaluators report that teachers and students are playing different roles and that, in many classrooms, teachers are teaching and students are learning mathematics and science in ways much more congruent with the mathematics and science standards recommendations.

First-year trends are positive. In two of the six districts, students' test scores improved sufficiently to move those districts out of the academic emergency classification. External evaluators and administrators report that teachers and students have new and more positive attitudes and expectations of one another. Students report that they like science and mathematics more than they used to and feel more successful in those disciplines. One problem that is emerging in two of the districts is that parents are concerned that mathematics and science expects students to find answers themselves rather than teachers teaching them the content. A few parents are unhappy that they do not understand the new approaches well enough to assist their children. Some want to return to earlier textbooks that had homework and worksheets to complete at home. In the next few years, we know we need to assist districts in communicating better with their parents about new math and science expectations emerging from a world economy and in ways to make them feel more comfortable with engaged-learning strategies.

Wisconsin

Wisconsin Rapids Public School District

Wisconsin Rapids has been an MSC intensive site for the past four years and will remain as such for the next five years. Accomplishments in these years included the development of a K-12 science curriculum framework and beginning implementation, elementary science curriculum materials review/purchase by all K-6 teachers, Grade 9 and 10 comprehensive (integrated) science curriculum writing and course pilots, Grade 7 and 8 comprehensive science curriculum writing (pilot 2000-2001), K-12 mathematics curriculum framework revision, Grade 6 through 8 materials review, adoption, training and implementation of the Connected Mathematics Project, and the K-5 and Grade 9 through 12 review and pilot of mathematics materials with adoption and purchase scheduled for the 2001-2002 school year.

A complete evaluation was completed and presented to the Wisconsin Rapids Public Schools School Board at an open meeting in July 2000 and at a communitywide processing meeting in the fall of 2000. The results of this evaluation and the meetings will serve as the basis of planning in mathematics and science for the next five years. This is just the first of a series of planned annual evaluations to gather data that facilitates district- and building-level, data-driven decision making and to provide MSC with information that will enable us to serve Wisconsin Rapids and other districts better.

Wisconsin Rapids will continue to be an intensive site for the next five years. Future goals for Wisconsin Rapids include continuing to reinforce K-12 science and mathematics reform efforts through long-term professional development efforts, (2) revisiting the K-12 science and mathematics curriculum frameworks, (3) working with the teachers piloting and implementing mathematics materials, (4) aiding in the development and implementation of the district's five-year

professional development program, and (5) gathering data each year for the five-year longitudinal study of mathematics and science reform efforts in the areas of student and teacher learning. A more detailed description of the work in this site and the evaluation report is found in the Appendix.

OBJECTIVE 3: MSC will provide training and technical assistance to teachers, administrators, and other educators that will enable them to improve teaching and learning in mathematics and science continually.

Many instances can be cited of ways that MSC have worked with teachers, administrators, and other educators to enable them to continuously improve teaching and learning in mathematics and science. Special emphasis has been placed on the use of technology.

Included in the areas of technical assistance are school improvement planning, product development, implementation, and evaluation; Web site development; curriculum frameworks development and implementation; and materials selection, implementation, and evaluation. Annual survey results show that between 89 and 93 percent of respondents stated that the technical assistance provided helped them improve teaching and learning. In order for changes in teaching and learning to occur, MSC strongly believes that long-term, follow-through support must be provided. Technical assistance must build capacity and serve as a model, and stakeholders must be empowered to engage in a continuous process of seeking improvement of the system. The following descriptions, listed in alphabetical order by state, illustrate ways MSC has provided technical assistance that aligns with these beliefs.

In addition to these direct services to schools, intermediate units, and state departments, MSC staff deliver presentations at national, state, and regional conferences for the National Staff Development Council (NSDC), the National Council of Teachers of Mathematics (NCTM), the National Science Teachers Association (NSTA), and the Association for Supervision and Curriculum Development (ASCD), as well as regional professional organizations. More than 100 presentations have been conducted during the past five years. Topics have included a variety of professional development and pedagogical issues such as teacher change, curriculum mapping and alignment, data-driven decision-making, the Third International Mathematics and Science Study (TIMSS), and more. These presentations represent a real component of our overall dissemination effort, providing broad-based awareness of our products and services. Because of the breadth of impact, we will continue delivering presentations at large-scale conferences in the next grant.

Illinois

The Learning Cooperative—Chicago, IL; Walled Lake, MI; Indianapolis, IN

The Learning Cooperative Challenge Grant was an effort to provide professional development on mathematics and science curriculum cooperatively in Indianapolis, Chicago and a suburban district in Michigan through online and Web-based support. NCMSC provided technical assistance to the project to promote progress on the major goal areas of the project: Building a technology infrastructure, fostering a community of learners, and developing curriculum support units

(CSUs). This effort was not successful primarily because it was before its time technologically. We had not expected this because the same telephone company (Ameritech) that provides service to all three areas would also provide the needed high-end compatibility. What we learned was that each state had a different standard and capacity, which meant we had to work with the lowest level of compatibility in all sites. This bandwidth was so bad and service so haphazard that it frustrated teachers beyond their endurance. In addition, we encountered serious problems with coordination and leadership from the lead site. We decided to terminate our participation, effectively ending the effort.

However, we learned a lot about online professional development, and we did provide quality professional development as measured by teacher satisfaction relative to content in a delivery format. It was not successful as an interactive learning community because the bandwidth concerns were so serious. Overall, though, we would need to classify this effort as the least successful during our five-year contract.

We must acknowledge that the impact of this effort was more significant for us than for the teachers with whom we worked. We later became very successful users of technology, but this early effort taught us how much research, up-front agreement, and collaboration was necessary to provide cross-state and cross-site assistance. We learned that state accountability measures were more powerful motivators than perceived learning community commonalties.

East St. Louis

MSC was invited by the Illinois State Department of Education to work with the East St. Louis School District, the lowest-achieving district in the state. MSC facilitated a two-week summer institute for building-level administrators. Professional development was provided to junior high and elementary teachers on the use of manipulatives in mathematics and science. Several trainings on the use of technology to support engaged learning also were held with some of the administrators.

Hawthorn-Irving School, Rock Island

MSC's work with Hawthorn-Irving School in Rock Island began as a result of a referral from East St. Louis School District. During the past several years, this school consistently has had the lowest reading, mathematics, and science scores in the district. Many of the students in this school are transient; only 23 percent of the school population remains from the beginning of the year to the end. MSC began its work in this school by sharing fourth- and eighth-grade TIMSS results and then provided hands-on, cooperative-learning strategies for classroom teachers. The lower-elementary teachers were very receptive to incorporating these skills and strategies into their classes, while many of the upper-level teachers were more reserved.

Harvey District #152

MSC's work in Harvey District 152 began in efforts to help district personnel affect their goal for technology integration into the mathematics programs. Intensity increased when the state of Illinois identified this district as a low-performing K-8 district in mathematics, and the district's assistant superintendent asked MSC to aid in materials adoption processes. We now have selected Harvey District 152 as our Illinois Intensive Site for the next five years. We will be working in the area of mathematics materials implementation (Math Trailblazers and Connected Mathematics Project) and systemic reform.

Waukegan District #60

MSC loaned the mathematics portion of the PCIIM collection for districtwide materials review and served as consultants to central office personnel in their efforts to select quality materials that address both district and state standards.

Illinois State Board of Education Science Literacy Panel

An MSC staff member was appointed as a representative to the Illinois State Board of Education Science Literacy Panel. This panel was created in response to recent legislation calling for such a committee.

Indiana

LaPorter County—Professional Development Consortium

This project focused on work with professional development leaders in the LaPorter County area related to integrating technology into the classroom, using specific multimedia packages/equipment, and planning a summer academy (1999) for teachers. MSC staff, in collaboration with Fermilab staff, provided resources, research, and best practice related to professional development in these areas. Fermilab staff continues to provide technical assistance to the consortium on an as-needed basis.

TIMSS Invitational Workshops

MSC partnered with the Indiana Department of Education and Educational Service Centers to provide professional development to a network of teachers throughout Indiana in order to build their capacity in using the TIMSS information and accompanying resources for professional development efforts. The goal was to link the TIMSS data with continuing efforts in Indiana to improve mathematics and science classroom teaching and learning. There were four sessions throughout the state in Hammond, Anderson, Clarksville, and West Lafayette. Data gathered from these meetings indicate that the information was well received and currently is being used in several Indiana professional development initiatives.

Iowa

Iowa Department of Education

MSC staff provided technical assistance to the Iowa Department of Education in the design of a CD-ROM to be used by school districts to create local standards and align curriculum and assessment with those standards.

Iowa City Community Schools Science and Mathematics Review Team

MSC assisted the Review Team during a yearlong effort to transform the district's science and math curriculum. MSC planned and facilitated quarterly meetings. The Review Team successfully accomplished its task to revise the K-12 mathematics and science curriculum.

Michigan

Michigan Mathematics and Science Center Network

MSC assisted in building the capacity of Mathematics and Science Center directors to implement new strategies of professional development in their regions and to help them apply the Bay Area School Reform Collaborative's Support Provider Rubric to their work. There is anecdotal evidence of change in the way the centers design and support professional development. There clearly has been a change in the language of professional development, moving away from talk of "delivery" and "menu offerings" and toward "engaging teachers" and "job-embedded professional development."

Frame and Tapestry Learning Community

MSC staff facilitated a monthly case study group of Michigan educators interested in designing a statewide mathematics and science professional development plan. This initiative built on the professional development leadership network through the Michigan Statewide Systemic Initiative (MSSI) grant. Organizations represented included the Michigan Department of Education, Michigan Education Association, Ingham Intermediate School District, Middle Cities Education Association, and the Michigan Mathematics and Science Centers Network.

Michigan Institute for Study of Leadership and Professional Development

MSC's focus in this initiative was building the capacity of school and district administrators in Northern Michigan to support math and science systemic reform. Inspired by the work with administrators of the Michigan Statewide Systemic Initiative and coordinated by the Northern Lower Michigan Leadership, Teaching and Learning Consortium, this initiative was a Goals 2000-funded effort. MSC worked on the original proposal, participated on the project's steering committee, and conducted professional development sessions at two annual conferences. Some participating administrators are making a concerted effort to support job-embedded professional development in their schools.

Promising Academic Cost Effectively (PACE) Telecommunications Collaborative

In partnership with SEE-North, one of Michigan's Mathematics and Science Centers, MSC met monthly for a year with teachers from three rural, low-income, and low-achieving northern Michigan districts to help them integrate inquiry into their teaching. Teachers codeveloped and taught inquiry-based units and learned how to use the Coalition of Essential Schools tuning protocol process to critique their work. All three schools demonstrated increased scores on MEAP science tests following the year of professional development.

Low Interim and Chronically Low Interim Schools Project at the Northern Lower Michigan Leadership, Teaching, and Learning Consortium

MSC, in partnership with two Mathematics and Science Centers assisted the Northern Lower Michigan Leadership, Teaching and Learning Consortium to build the capacity of technical assistants to support improvement efforts in 13 Northern Michigan districts. In addition, MSC and the two Mathematics and Science Centers provided technical assistance to one of the districts (Alba). Some of those 13 districts are now off the state's list of low-performing schools.

Grand Traverse Regional Mathematics, Science and Technology Center

MSC supported the increased effectiveness of the center by serving on its Advisory Board and by facilitating a staff study group on professional development. Effectiveness has been demonstrated by the center's replacement of a traditional menu of workshop offerings to a more collaborative and constructivist partnership with teachers, schools, and districts.

Michigan Rural Systemic Initiative

MSC provided technical assistance to the Michigan Rural Systemic Initiative (MiRSI) management team in both project design and implementation. MSC also provided professional development to MiRSI's technical assistants (now called regional coordinators). Following MiRSI's one-year planning grant, MiRSI received a five-year, $4.5 million NSF grant. MSC staff will continue to provide technical assistance to MiRSI in the implementation of this five-year grant.

Michigan Mathematics and Science Alliance

The Michigan Mathematics and Science Alliance (MiSMA) was formed in 1999 as an outgrowth of MISSI. The alliance was formed to further the vision of systemic reform of mathematics and science in Michigan. MSC staff were members of the Mathematics, Science and Technology Committees and chaired the Building Individual Capacity Action Team and the Student Assessment Action Team. In addition to facilitating meetings of those two teams, staff helped prepare a design for a regional professional development learning community.

EDC Science Curriculum Center

In partnership with the Grand Traverse Regional Mathematics and Science Center, MSC fostered a collaboration with Education Development Corporation (EDC) of Newton, MA, to establish a science curriculum center in northern Michigan. MSC staff helped design and implement planning meetings and a three-day seminar for school teams.

Minnesota

Minneapolis Public Schools

Minneapolis Public Schools invited MSC to do an analysis of its science program and to make recommendations for improving the program, with special attention to improving the performance of African-American and Native American students. The analysis was completed and recommendations were made for supplementary activities in areas of highest need. MSC provided a series of workshops that were received very positively by teachers. They began with research findings of the benefits of hands-on science and ended with examples of especially good Internet-based activities.

The teacher evaluations and the perceptions of the Minneapolis central office were very positive, especially about the materials, resources, and strategies that were demonstrated. Conversations with teachers and observation of their classrooms revealed that teachers were using many of the resources and strategies covered in the workshops. Evaluations had high scores and the relationship was terminated only because the school district moved the staff development focus to reading when those scores came out much lower than science scores.

Efforts to document outcomes and impacts of the work proved very difficult because of the huge turnover in student populations and the problems associated with attribution. Minneapolis Public Schools provide a variety of assistance to these teachers. Science scores increased but, realistically, the high-quality professional development in the use of FOSS provided by MPS staff likely had a greater impact.

Minnesota Department of Education

Minnesota Department of Education invited MSC to do an independent analysis of their TIMSS results. Like the First In The World Consortium, Minnesota chose to be a part of TIMSS as a "nation." Minnesota gave us access to their raw data, and we did an analysis beyond that provided by Boston University. Minnesota had completed its own analysis and also had asked the University of Minnesota to look at the data. The University of Minnesota and MSC shared and exchanged additional data they had been able to extract, and the two agreed that the University of Minnesota would focus on the differences of population scores, especially the various categories of minority students, while MSC focused on curricular implications. The MSC TIMSS analysis was the catalyst and foundation for the development of the large Web site known as Minnesota EdSTAR, described in Objective 1.

Minnesota Department of Education used and shared the analysis with many school districts. Department staff indicated that the analysis and recommendations were useful and helped them determine priorities for professional development and purchases of curriculum resources.

The greatest evidence of this work's usefulness was that it resulted in the creation of EdSTAR, and that EdSTAR is becoming a major component of Minnesota's professional development effort. EdSTAR dissemination and use is a major focus of the work of the 16 regional professional development providers and the 16 exceptional teachers who are on one-year leave of absences from their positions while they work with the Minnesota Department of Education. Those workshops are just getting underway, but discussions with pilot sites reveal that they are very positive about EdSTAR and the professional development opportunities.

Ohio

Columbus Urban Systemic Initiative

MSC staff provided direct professional development assistance to a team of K-12 teacher-leaders and department chairs from Columbus Public Schools in adult learning, change, and designing effective, long-term professional development in mathematics and science education. Staff also have facilitated and participated on a design team for Whetstone High School on building a system for school-community-business partnerships. The partnership worked on creating a technology-based system called the Virtual Visitor System, which uses a problem-based approach to partnering.

National Science Education Leadership Academy

Through WestEd's Academy, MSC committed to mentoring two emerging professional development leaders from Ohio's Science and Mathematics Center in Columbus. Both the Ohio participants and WestEd's project evaluators judged MSC's work to be effective and directly relevant. The Ohio Math and Science Center is viewed in the field as an unusually effective organization; since the conclusion of our work with the two staff members, MSC has sub-contracted with the center for professional fieldwork.

Cleveland Urban Systemic Initiative

MSC staff began their involvement with Cleveland by providing technical assistance to the central office staff in their movement from a centralized system for delivering professional development to school-based professional development. The technical assistance provided included such things as resources, learning opportunities, team-building, and strategies for creating interdisciplinary curriculum.

The assistance then shifted to training principals who were a part of the Discovery program. Training on what it means to have more equitable teaching and learning in mathematics and science classrooms was given to 40 principals. In addition, MSC provided technical assistance in two of Cleveland's public schools. MSC's work in Garrett Morgan Middle School was to

facilitate integrating technology in the mathematics and science program and working with the staff to decide how to use school data to inform daily decision-making. Work in Louis Agassiz Elementary School was targeted in the area of equity.

There were many changes within the Cleveland school system during the time we were working in including the takeover by the mayor and appointment of a new superintendent. Many of the people we had worked with either are no longer working for the school system or were assigned to positions that are no longer connected to the work that we had done with them. Consequently, our work was put on hold. A superintendent has been hired and stability is starting to resume. Conversations have begun again, and we expect to resume this scope of work in the next grant.

Project SMART (Science and Mathematics Achievement Required for Tomorrow)

At the request of the Ohio Department of Education and Project SMART members, MSC was invited to do an independent analysis of the Project SMART TIMSS R results. We have had two meetings and discussed preliminary data and the possibility of creating an Ohio EdSTAR together with Project REAL. Work will be completed when TIMSS R Data for Project SMART is finalized and released in March 2001.

Wisconsin

Milwaukee Urban Systemic Initiative

MSC work with the Milwaukee USI centered on curriculum framework development and alignment with district, state, and national standards and in providing professional development. MSC staff worked with math and science committees and central office math and science supervisors throughout 1998 to put together K-12 curriculum frameworks in both areas. These frameworks were board-approved. MSC staff members also provided leadership sessions for the Cadre Facilitators Course offered in collaboration with the University of Wisconsin-Milwaukee. These facilitators work with regional cadres monthly in middle-level mathematics and elementary science implementation. Professional development work has included curriculum framework implementation, performance assessment, leadership, change, and equity.

CESA #11

MSC staff worked with CESA #11 in several different ways, including the codevelopment of the Family of Learners Resource Guide and CD-ROM. They also have acted as consultants in the Title I School Improvement efforts using Changing Perspectives in their mathematics and science professional development efforts and Science T.R.E.E. in their basic science instructional design efforts. Recently CESA #11 was identified to serve as an ENC Access Site (see Objective 5).

Tomah Area School District

MSC staff worked with the Tomah curriculum director to train a group of 24 teachers to facilitate the implementation of the district's new standards-based curriculum frameworks. These

facilitators worked in their buildings in all content areas and coordinated a daylong workshop to further delineate the frameworks documents.

OBJECTIVE 4: MSC will work through the National Organization Task Force on Informal Education, energy labs, museums, and other informal education entities to promote the increased use of informal educational resources.

Many collaborative efforts are cited under this objective, which focuses on the importance of informal education entities as learning communities. MSC has participated on the Informal Science Education Network (ISEN) Advisory Board that consists of representatives from organizations ranging from zoos, museums, botanical gardens, state and federal departments of natural resources to business and industry partners such as Motorola, Waste Management, Eli Lilly, and the Henry Ford Museum.

Each collaboration illustrates ways MSC has fulfilled the many purposes of the Informal Science Education Network Advisory Board. The purposes include (1) to identify informal groups throughout the nation, (2) to discuss existing education programs and their dissemination, (3) to develop connections between informal education and regional intensive sites, (4) to disseminate research-based materials on professional development, best practice, and engaged learning, (5) to promote increased use of informal education sites, and (6) create links and foster use of the MSC and ISEN Web sites.

Fermilab: Web-Based Curriculum Units

Fermilab Lederman Science Center, Friends of Fermilab, classroom teachers, and MSC staff worked together to create a curriculum design that resulted in the creation of exemplary 19 curriculum units that demonstrate applications of "engaged learning and high technology" applications of key mathematics and science concepts. The units are available on Fermilab's Web server at: http://www-ed.fnal.gov/help/. We continually receive requests from classroom teachers asking how to access more of this type of information.

The Science Museum of Minnesota

An initial meeting of museum staff and MSC staff was held in March 1996 to identify common interests, share areas of expertise, and determine the potential for collaboration. At a second meeting a year later, MSC staff presented a collaborative proposal in the areas of "Museum Science" and "Technology" that developed connections between informal education and classroom sites, promoted increased use of informal education sites, and created links to the museum and the Informal Science Education Network Web sites. All resources supported inquiry-based science and would be created for and by teachers and students for use by teachers, students, and parents.

After a lengthy discussion, this proposal was deferred because the museum was moving to a new location and would be involved in that process for some time. It was decided, however, that because the museum already had established an extensive educational outreach in the

Minneapolis/St. Paul area, it would become one of the Eisenhower National Clearinghouse (ENC) Access Centers, integrating ENC mathematics and sciences resources into their work with the area schools. Based on data collected, this collaboration has proven to be an effective one for the museum, the ENC, and the Mathematics and Science Consortium.

Informal Science Education Network

The Informal Science Education Network (ISEN) is a collaborative effort of the Association of Science Technology Centers (ASTC) and the regional educational laboratories to create a network of informal science educators to foster informal science sites as learning opportunities (sites) that support district curricula. These informal sites provide rich and stimulating environments outside of the typical school setting where individuals of all ages can increase their knowledge, appreciation, and understanding of scientific principles and topics.
Collaborative workshops with Fermilab, WestEd, and ASTC have been conducted for school districts during the past five years to increase their knowledge of sites both within and outside the region. The network developed the Web site, www.scienceadventures.org, to increase awareness of informal science sites across the nation. This site is a database of exemplary informal science sites listed by state across the country and includes information about the educational opportunities provided at the site. Data indicates many use the Web site to find informal sites that can support their curriculum.

National Center for Supercomputer Applications (NCSA) at the University of Illinois

MSC, the North Central Regional Technology in Education Center (NCRTEC), and NCSA have had a partnership that involves the two North Central organizations examining products developed by NCSA from such powerful applications as Three Dimensional Caves that require supercomputers to operate to software to run on desktop PCs found in schools. This has been a very positive relationship even though the products explored largely have been limited to high school settings. The purpose of the work with NCSA is to help us stay on the cutting edge of computer simulation and modeling. We have shared some of the work with schools, but in most cases, the products have been too developmental in nature to justify developing professional development efforts around them. This may change in the next grant period, as NCSA will be releasing some finished products in February 2001. One of our staff is participating in that release.

EnergyNet Advisory Board

EnergyNet was a statewide, problem-based, learning network-enhanced science curriculum project. An MSC staff member served on the advisory board and chaired the evaluation advisory committee in the early years of the NCSMC grant. Technical assistance was provided in issues related to online telecollaboration and Web site design to enhance curriculum implementation, pedagogical approaches, formative and summative evaluation approaches, and scaling-up strategies.

OBJECTIVE 5: MSC will work with its collaborative regional networks, other consortia, and the Eisenhower National Clearinghouse to identify and describe exemplary resources and best instructional practices.

The primary work within this objective has been to collaborate with the Eisenhower Consortia and Clearinghouse in order to identify, describe, and disseminate exemplary resources and best practices. The activities described within indicate collaborative efforts both regionally and nationally. Clients and potential collaborators receive information about the work of the consortia and Clearinghouse, and how connecting with them will benefit their work.

Blueprints CD-ROM

The *Blueprints CD-ROM* resulted from a cross-consortia collaborative for which NCSMC was the lead agency. *Blueprints* was designed to assist both novice and experienced facilitators in creating meaningful professional development experiences for mathematics and science educators. The toolkit is divided into six sections: Introduction, Scenarios, Activities, Group Processes, Templates, Resources, and the *Blueprints* Web site. The introduction describes the CD's purpose, uses, and benefits. The scenarios are recommended activities that fulfill common professional development needs in schools. Activities are grouped into the categories of professional development, curriculum, instruction, and assessment. Descriptions of 22 tested, reliable group processes are provided, along with facilitator notes and support materials for successful facilitation. Templates are provided for designing professional development activities and for establishing a journal and portfolio. More that 300 resources are provided, including articles, Web sites, and multimedia resources. The *Blueprints* Web site includes updated material and other timely professional development information.

Throughout the development stages, beta testing and rigorous reviews took place by the Cross-Consortia Design Team and other professional development field staff. *Blueprints* was then refined based on feedback received, and the CD-ROM was completed in spring 2000. In May, ENC hosted a mini-conference for consortia participants to be trained on the uses of this CD-ROM. *Blueprints* was well received by our consortia partners, each of whom had their own plans for dissemination. The 10 consortia members and the ENC received 23,000 copies of the CD-ROM.

MSC's dissemination plan has included demonstrations and training of *Blueprints* for MSC Advisory Board members, MSC State Teams, NCREL Board Members, and many other partner groups. We also have conducted a two-day training in Minnesota and are preparing for a comparable training in Indiana. The CD-ROM has been featured at many regional and national conferences. Most notably, a copy of *Blueprints* was given to each of the 4,000 registrants of the National Staff Development Council's annual conference, held in December 2000.

Demand for *Blueprints* has warranted a second printing of 13,000 copies of the CD-ROM for MSC/NCREL distribution. Given the high demand for this product, we have improved the product rather than simply replicate it. In particular, we have improved the customizable

templates on the CD-ROM because users indicated that the templates added considerable value to their work in the field and their ability to meet their constituent's needs.

Pathways to School Improvement: Critical Issues

A critical issue is a multimedia document that examines a particular subject within a topic area. MSC has contributed to or written 14 critical issues for NCREL's *Pathways to School Improvement* Web site: MSC produced three critical issues in professional development, one in curriculum, and five each in mathematics and science.

MSC Web Sites

MSC developed and continues to update its own Web site, which provides links to many valuable resources. The information can be accessed from NCREL's Web site (http://www.ncrel.org/msc/msc.htm), and there also are links to other MSC-developed resources that are described in this report.

The table below provides an overview of all active Web sites that MSC has helped produce during this grant period, along with the average weekly number of accesses, or hits, received by each site. A complete description of each Web site is found elsewhere in this report.

Name of Web Site	Web Site Address	Average Number of Access per Week
EdSTAR	http://edstar.ncrel.org/mn	8,251
Fermi Exemplary Units	http://www-ed.fnal.gov/help/	2,106
MSC Web Site	http://www.ncrel.org/msc/msc.htm	2,055
15 Critical Issues on Pathways to School Improvement Web Site	http://www.ncrel.org/sdrs/areas/issues/	1,572
Learning Through Technology	http://www.ncrel.org/tandl/homepg.htm	1,401
First in the World	http://www.1stintheworld.org	916[2]

[2] This site was recently moved to the FITW server.

The Eisenhower National Clearinghouse Demonstration Site at Fermilab's Lederman Science Center

The North Central (formerly Midwest) Demonstration Site is one of 11 sites nationwide funded by the U.S. Department of Education. MSC leveraged regional resources of the Department of Education and Department of Energy by forging a collaboration with ENC and Fermi National Accelerator Laboratory Lederman Science Center to develop the demonstration site for our region. This partnership has proven to be phenomenal: Through the efforts of all partners, vendors continually provide resources for the site. Currently the Lederman Science Center is working on an automation project for its many resources.

During the past four years and across our seven-state region, this partnership has sponsored annual software reviews, annual mathematics and science resource fairs, professional development activities, curriculum showcases that share exemplary mathematics and science materials, and a process for review, selection, and implementation, and the dissemination of the TIMSS Resource Kits. The professional development especially has focused on the areas of curriculum development, alignment, and integration with teachers and preservice teachers at local universities.

Data indicates that this partnership is strong and the quality of the work is exceptional. Future work will continue to identify and provide exemplary mathematics and science materials, professional development opportunities, and technical assistance throughout our region.

Eisenhower National Clearinghouse Access Centers

At an Eisenhower National Clearinghouse Access Center facility, the educational community can learn about and access K-12 mathematics and science resources with the assistance available from the ENC, its Web site, and from MSC. The North Central Region has established 11 access centers in both urban and rural areas, and other strategic locations in six of the seven states. The majority of the access sites (7 of the 11) are located in an intermediate unit agency, while two are in higher education institutions, one in a technology center, and one in an informal education site. The coordinators of these centers meet annually to network and share professional development opportunities within their areas.

Access sites currently exist at the following locations:

- Science Museum of Minnesota, MN
- CESA 6; Oshkosh, WI
- Illinois State University-CEMAST; Bloomington, IL
- Educators' Technology Center of Indiana; Indianapolis, IN
- Capital Area Science and Math Center; Lansing, MI
- AEA 11; Johnston, IA
- AEA 15; Ottumwa, IA
- AEA 5; Fort Dodge, IA
- AEA 9; Bettendorf, IA
- Bemidji State University; Bemidji, MN
- CESA 11; Turtle Lake, WI

(*Note:* The last five access sites just recently opened. Technically, they opened in the next grant period, but conversations to open these sites started during the previous grant.)

Best Practice Newsletter

In the early years of the grant, MSC staff collaborated with National-Louis University and Jones House Publishing to produce the *Best Practice Newsletter*. This was a research-based newsletter

written by and for classroom teachers. Articles selected for inclusion were reviewed by National-Louis University staff and had to demonstrate characteristics of exemplary practices based on the current educational research on engaged learning. *Best Practice* was delivered to 13,000 teachers in the city of Chicago, more than 3,000 educators on the MSC mailing list, and people throughout the region who requested copies. The newsletter is no longer printed, but back issues are archived on the MSC Web site.

Cross-Consortium Equity Task Force

An MSC staff member served on the cross-consortium Equity Task Force. The major charge of the task force was to produce a CD-ROM, "Making Schools Work for Every Child." Once the CD-ROM was completed each consortia member determined specific dissemination strategies. MSC disseminated the CD with equity work that was done, including the Iowa Governor's Conference and Chicago Systemic Initiative institutes. The CD-ROM also is packaged with the CWL Equity Toolkit. We have showcased the CD at MSC Advisory Board and State Teams meetings as well as an NCREL board meeting.

MSC staff helped develop a facilitator's guide to be used in conjunction with the CD-ROM. SERVE is the lead agency writing the guide, and ENC will be its producer.

The task force also updated the part of ENC Web site that focuses on equity. MSC was the lead on this project. Updating included submitting the latest research on equity issues, list serves, and Frequently Asked Questions (FAQ) section. The questions were framed using the Concerns-Based Adoption Model (CBAM), and answers included links to resources from the Web site.

This task force successfully has completed its charge and now has been converted to a task force working on the Cross-Consortium Middle School Mathematics Project.

ENC Advisory Board

An MSC staff member served on the ENC Advisory Board for four years. The role of the Advisory Board has been to give ENC input regarding the needs of the field and how to meet those needs. They also have critiqued ENC products. Specific contributions that have resulted from the work of the Advisory Board included developing and planning subject material for *In Focus* magazine, and writing and critiquing the "Attaining Excellence Through TIMSS" CD-ROM.

Promising Practices

MSC worked with the other consortium, ENC, and the U.S. Department of Education to identify promising practices in our region and documenting and disseminating those that were especially important. After a great deal of work, the consortia partners agreed on criteria and protocol for identifying promising practices. Programs and locations were nominated and, after consulting with the partners, the most promising were selected for site visits. Those that met the criteria were identified in a document that was shared nationwide, and the process was repeated a second year.

The resulting document was well received and MSC receives large numbers of requests for these materials. Surveys revealed that, although the information was interesting, the Promising Practice locations most cases were unable to provide follow-up information beyond that which the consortiums had sent. Sites could not and did not wish to use their own resources for external assistance if it meant taking away from resources being used for their district.

Several problems were evident with this effort. First, while the Promising Practice sites were pleased to be identified as exemplary, they did not receive resources to respond to requests for more information, visitor site visits, or on-site assistance. Second, because the dissemination materials were mostly print products, they became obsolete as funding, contact people and telephone numbers changed. The most serious problem was that the effort was not Internet-based. An Internet product allows dissemination at a much lower cost, and it offers the opportunity for frequent updates instead of waiting for annual updates to the information.

OBJECTIVE 6: MSC will initiate evaluation and data collection related to intended outcomes to determine the effectiveness and impact of consortium activities in districts selected for intensive partnerships.

Projects listed under this objective include those with which MSC has provided evaluation assistance (Waukegan Challenge Grant) and those district or school sites with which we have worked with intensively and are evaluating the impact of our involvement (School City of Hammond, Project REAL, and Wisconsin Rapids).

MSC staff has provided technical assistance in evaluation activities for several other projects. For some, evaluation assistance was not the main objective and therefore those projects are described elsewhere in the report. MSC's role in the Waukegan Challenge Grant was primarily to evaluate the Challenge Grant. More information on that evaluation is described below.

Waukegan Challenge Grant

MSC was written in as a partner into Waukegan's Challenge Grant proposal that was funded in 1995. MSC agreed to serve as the evaluator for that five-year project. In the first year of the grant, MSC staff also provided professional development to the middle school teachers in engaged learning strategies and the integration of technology.

The evaluation primarily focused on progress towards the four project goals. The four goals were to (1) improve student achievement in mathematics and science, (2) promote engaged learning through the adoption of project-based, collaborative learning teaching strategies, (3) increase students' and teachers' use of high performance technology and (4) improve student workplace readiness. During the past five years, a variety of quantitative and qualitative data were developed, collected and analyzed to describe the progress toward meeting these goals. The main methods of data collection and sources have included student test scores, teacher and student surveys and a portfolio review of the teacher units. Evaluation reports were produced annually and included as a part of the performance report that was required by the grant.

The evaluation findings indicated progress was made in each of the four goal areas. The progress may not have been as significant as was hoped. The Waukegan School District was hampered in their efforts for systemic change due to their 33 percent student mobility rate and high teacher turnover. Additionally, only one of the key projects leaders remained with the project for the entire five-year period.

Intensive Site Evaluation

Three MSC intensive sites were targeted for an in-depth evaluation and analysis of the extent to which the work of MSC is impacting teaching and learning. Evaluation plans were developed for Wisconsin Rapids, School City of Hammond and Project REAL. Implementation of the evaluation plans took place in the 1999-2000 school year. The data collected for this year is baseline. Annual comprehensive evaluation plans are planned to continue into the next five year grant allowing MSC staff to track changes in teaching and learning over time. Following is an overview of the evaluation.

Generally the evaluation questions were designed to gather data in the following areas: types of professional development received, changes in instructional practice, changes in student learning, challenges encountered, and leadership and support that has been received. Specific evaluation questions and data-collection instruments were tailored for each of the three intensive sites. Evaluation methods included teacher surveys and interviews, central office staff and building administrator interviews, student surveys and parent focus groups. In addition to these self-report types of measures, state test score data also is being collected to determine whether there is an increase in student achievement in the period of time MSC has provided technical assistance. Complete evaluation reports detailing the findings for each of these projects have been included in the Appendix

Other Activities

In order to facilitate and accomplish the work of the Eisenhower Consortia and Clearinghouse Network, three committees were formed: Directors' Committee, Evaluators' Committee, and Communication Committee. MSC has served in leadership roles and been actively involved with these committees. The MSC director has served as chair of the Director's Committee and serves on the Evaluators' Committee. The MSC evaluator has been responsible for aggregating data collected from the network's client survey. In addition to the annual client surveys, MSC has tracked its client-service activities through the Cross-Consortia Descriptive Data System (CCDDS). Both of these data sources were used by the Evaluation Committee to produce an annual report on the network. The evaluation effort helped the network and MSC reflect on their work to improve practice and impact. The Directors' and Evaluators' Committee have existed and met quarterly and biannually, respectively, for the last five years, while the Communication Committee was formed just in the last year of the grant). Formed to facilitate communication among consortium staff, ENC, and relevant national groups, the Communication Committee was. is charged with sharing resources, reducing duplication of efforts, and delivering the

consortia/Clearinghouse message to national audiences. Our involvement and outputs that have resulted from the three committees have added significantly to the quality of our work.

Highlights of MSC Client Interviews

This section summarizes the results of a series of client interviews conducted at the end of the grant with MSC project participants. This is just one of the evaluation methods that MSC put in place to assess its effectiveness and impact. The next two paragraphs briefly describe the other methods.

Several evaluation methods were established to collect both formative and summative evaluation data on MSC. The major emphasis of the evaluation has been on collecting, analyzing, and reporting data related to the three intensive sites (School City of Hammond, Project REAL, and Wisconsin Rapids) where we are willing to hold ourselves accountable to changes in teacher practice and student learning. This evaluation effort was described earlier under Objective 6.

MSC also has been an active participant of the Standing Evaluation Committee established by the Eisenhower Network. As part of this committee, MSC has contributed to the Cross-Consortia Descriptive Data System (CCDDS). Data were collected on MSC activities from each staff member on a quarterly basis, and information is collected on several different dimensions related to client-service activities. The database describes each client-service activity conducted by MSC in terms of participant affiliation and role (teacher, administrator, policymaker, etc.), the length of the activity, the type of service provided, content focus, contact method, and collaborators. The committee also has administered annual client surveys to assess the quality of the program's work. During the final year of the grant, the committee decided to conduct the client interviews with selected participants of consortium activities in lieu of the survey. The major purpose of the interviews was to gather data at the consortium level and aggregate it in order to report on the impact of the Eisenhower Network and the lessons that have been learned.

A random sampling approach was used to select the interviewees. A total of 15 interviews were conducted with teachers, administrators, and professional development providers who participated in ongoing technical assistance provided by MSC or who were participants in MSC partnerships, collaborations, teams, or networks. Interviewees represented all seven of MSC's states, and all had had a relationship with MSC for at least two of the five years. In some cases the relationships extended back even further.

Overall, the interviews were very positive and a number of specific examples of effects that have resulted from the work of MSC were cited. The teachers and administrators who were interviewed often mentioned the improvements that had occurred both in instructional practice and in student learning. As a result of the modeling done throughout the professional development and in their classrooms, teachers have an understanding of the types of changes they need to make and why these approaches are good for kids. Administrators also pointed to increases in teachers' knowledge and comfort with teaching math and science. One middle school teacher who teaches in a district classified as having a significant high-risk population described a change she has made in her teaching: "I have developed, through Project REAL, a class called 'Math Labs,' and it is

actually a hands-on engaged learning class. We do measurement, geometry, and problem-solving as our three areas, and it has changed because of the push from MSC on engaged learning."

As a result of assistance from MSC, it was noted there is an increase of hands-on mathematics and science activities, student-centered learning approaches were being used by the teachers, and learning was connected to real-life learning experiences. An administrator added: "Teachers are no longer just using the textbooks and the worksheets. They have students doing hands-on kind of things. They are working more with higher-order thinking skills."

Teachers remarked that they are seeing a relationship to the kind of instruction approaches they use and changes in student learning. In some cases, teachers even were able to cite instances of improved student performance as a result, such as an increase in state test scores. One school district administrator noted: "Our math scores increased. We went up a great deal in the two years that MSC has been working with us."

Interviewees indicated a key component to the success of these changes is the sustained nature of service MSC provides. Additionally, modeling of instructional practices in the context of the professional development has been instrumental. The technical assistance also has built the capacity of professional development providers. For example, one professional provider explains how this aided her professionally: "When I started working with MSC, I was pretty new to my job as director of the network. I worked very early on with [MSC staff member] and she helped me grow in so many ways. That was just a tremendous help to me and to my organization." Similarly another professional developer provider added: "[MSC staff member] has helped staff to become better facilitators of professional development and to really deepen our understanding of teaching learning."

In terms of the quality of the professional development, all interviewees strongly agreed the work of MSC had exceeded their expectations. Interviewees appreciated having technical assistance provided on-site and tailored to their individual needs. One educator stated: "The professional development is always itself engaged learning. There is no canned stuff." A principal added: "One of the key issues that the school had was in teaching teachers how to be better teachers. The fact that she was able to come on-site as opposed to us having to go somewhere else and listen to a lecture; that made it far more beneficial. The greatest impact was that she was on-site and in the classroom with the kids, modeling for the teacher."

A teacher adds, "I was just amazed with the professional development. I have never seen them pack so much stuff in such a small amount of time. You wanted to go back to school the next day and just dive in. It was high energy; packed with neat things you could take back and [use to] engage your kids."

Interviewees with whom MSC collaborated either in product development or delivery of services spoke highly of the quality of product or service that resulted from this collaboration. Often it was remarked that without MSC's contributions both in terms of staff time and other resources, these types of projects would not have been possible. One educator stated: "I think our initiative was at a moment when it probably would have failed. I sincerely doubt that we would have gone on if

MSC hadn't stepped in at that particular moment. We certainly would not have had the impact that we did. Our children are succeeding, and it turned around that mentality of Chicago Public Schools being failures."

In almost every instance, it was mentioned that other opportunities have arisen as a result of the initial collaboration on some project. One collaborator said: "The fact that we have had such a positive relationship with MSC has opened up a number of other doors in terms of other projects that we might work on and we see other opportunities to use their services." Collaborators also were pleased with the outcomes of the relationships. One shared: "I wish all the relationships with outside partners or agencies would be as fruitful as this one was."

Other specific outcomes that resulted from these relationships include access to resources and leveraging of resources. For example, the PCIIM Curriculum Showcases have enabled teachers to view numerous curriculum materials and select high-quality resources based on the review. In turn, the adoption of curriculum resources that support best practice is causing teachers to change their instructional practices.

Interviewees believed MSC fills an important niche not addressed by other organizations. Specifically mentioned was the link and access provided to services and products as well as other regional and national programs and products. MSC provides a broad perspective on what is happening in education that has been particularly helpful to those in isolated rural regions.

A fundamental strength of MSC, according to those interviewed, lies in the quality of its staff. That MSC staff has experience working in schools and an extensive knowledge base in mathematics and science education gives them strong credibility. One individual remarked: "I think what I really like about the consortium and a real credit to them is that they have been in the schools. I know that they have talked to practitioners, and they have been practitioners themselves. So having people who have been there and can talk about their experiences to teachers is a real value."

Most individuals feel that MSC should continue the type of work they have been doing. The only suggestions voiced for change related to accessibility and public relations. Many individuals wished there were more MSC staff to assist in doing all that is needed in mathematics and science reform. Others felt MSC needed to increase awareness of its services and products.
MSC staff plans to review the data gathered and synthesized from these client interviews as well as other evaluation data, such as intensive site evaluations, to decide how to continue to address the needs within the region. Lessons learned then can be applied to other settings and enhance our next five years of effort as we work toward advancing systemic reform in mathematics and science education in the North Central region.

Appendix A

Vision, Mission, and Beliefs

Vision

The Midwest Mathematics and Science Consortium (MSC) provides direct technical assistance to state education agencies, intermediate state educational units, and local school districts to advance systemic reform of mathematics and science in the states of Illinois, Iowa, Indiana, Ohio, Michigan, Minnesota, and Wisconsin. Based on a constructivist learning philosophy and informed by best practice and research, technical assistance efforts focus on helping provide meaningful, purposeful, and engaging mathematics and science learning experiences for all students. Whenever and wherever possible, the appropriate use of technology to support and accelerate systemic reform is advocated.

Mission

The mission of MSC is to advance systemic change in mathematics and science education through (1) collaboration with institutions and agencies within the region, (2) direct services and technical assistance to school districts, schools, teachers, and administrators to support high-priority initiatives, (3) support that will result in the development and implementation of standards, curriculum, assessment, and performance indicators that challenge students to higher levels of attainment, (4) identification and dissemination of resources, methods, materials, and practices that expand learning beyond the classroom through informal education agencies and electronic media, and (5) access to networks of instructional resources and materials that will result in improved learning for all students.

Beliefs

Systemic reform of mathematics and science education is a complex challenge that must be grounded in a well-defined set of beliefs. Because the system as a whole is the challenge, the beliefs must relate not only to the nature of learners and learning, but to organization and change theory as well. Finally, the beliefs must speak to the nature of interventions that are most likely to facilitate continuous improvement of mathematics and science learning for all students. MSC beliefs about each of these parts of the system are further articulated below.

Consortium beliefs about students and learning:

- All students can benefit from meaningful and active engagement in learning.
- The knowledge, skills, and understanding necessary to become lifelong learners are best acquired when students are allowed to build on prior experience and learning.
- Because each learner presents a unique set of experience and attributes, there are a variety of methods and approaches that will result in meaningful learning.

- The only constant across all learners is that when they are allowed to engage in learning that is hands-on, minds-on, and authentic, they are more likely to become highly motivated and self-directed.
- The acquisition of knowledge, skills, and understanding is best supported through a variety of assessment practices that provide multiple opportunities to gauge and communicate the level of learning relative to well-defined expectations.

Consortium beliefs about the nature of the education enterprise:

- The most significant element of the education enterprise is the instruction that takes place within the classroom.
- Dedicated teachers continually seek to improve their practices and willingly adapt and adopt new ideas and approaches they believe to be consistent with the goal of enhanced learning for their students.
- Enlightened educational leaders empower teachers to be creative and inventive in their choice of teaching practices and provide support that facilitates improved learning.
- Standards and Curriculum Frameworks exist to shape and guide practice and are used most effectively when education professionals are involved in their development and apply them to learning opportunities for students.
- Assessment systems must exist for the primary purpose of informing instructional choice and therefore must be embedded in the learning process, varied in methodology, and focused on application and performance that demonstrate the acquisition of expected skills, knowledge, and understanding.
- Technology provides a powerful tool that can both enhance and facilitate student learning, and therefore it should be available and used by all teachers and students.

Consortium beliefs about the system interventions:

- Continuous improvement of student learning is the fundamental goal of systemic reform.
- Technical assistance must build capacity and serve as a model.
- Technical assistance includes providing technical expertise and resources, cross-pollinating and connecting groups, serving as a "critical friend," and helping constituents learn to identify and address needs, focus on the long-term, and assess growth.

Appendix D

MSC Products and Services
1995-2000

Product/Service	Objective	Miscellaneous Notes	Timeline
Objective 1: MSC will facilitate and engage in collaborative efforts with teachers, administrators, and professional organizations to build capacity and leverage resources to achieve the outcome of systemic reform of mathematics and science education.			
Learning Through Technology	1	Product—Web-based	1995-1997
Mathematics Problem-Solving Cases	1	Product—Print Resource	1995-1998
Science T.R.E.E.	1	Product—CD-ROM	1995-2000
Connecting With Learner—Equity Toolkit and Equity Task Force	1	Product—Print Resource and Collaboration between MSC and the Michigan Dept of Ed.	1995-2000
Changing Perspectives	1	Product— CD-ROM/Videotapes/Cassette Tapes/Facilitator's Guide Formal Trainings: 1.CESA #1, WI 2.CESA #5, WI 3. Region 14 Service Ctr, FL 4. Austin P.S./SEDL, TX 5. Illinois State Univ, IL 6. CESA #7, WI 7. UW-Parkside, WI 8. NSDC Presentation 9. CESA #10, 11, 12, WI	1995-2000

Product/Service	Objective	Miscellaneous Notes	Timeline
		10. NCTM Regional Mtg., Milwaukee, WI 11. Illinois Suburban ASCD, IL 12. Teachers Section of Iowa Academy of Science, IA 13. Project Choices, IL	
Family of Learners	1	Product—CD-ROM/Print Resource	1996-2000
PCIIM	1	Materials collection available for review Curriculum Showcase Sites: 1. Wisconsin Rapids, WI 2. Iowa Governor's Conference 3. AEA 5, IA 4. Illinois State—SciMast, IL 5. Wisconsin Leadership Conference, WI 6. MN Best Practice Network and Friends; Minnetonka, MN 7. CESA #11, WI 8. Harvey, IL 9. Waukegan, IL 10. Minnesota Curriculum Showcase, MN	1997-2000
Ohio Math and Science Coalition	1	Product—Report	1999
EdSTAR—Minnesota	1	Product—Web-based	1999-2000

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Product/Service	Objective	Miscellaneous Notes	Timeline
Objective 2: MSC will establish and implement a process to identify high-impact, high-priority projects, products, and services that respond to the needs of our collaborative partners. MSC will develop relationships with two or three "intensive" sites in each state to collaboratively research and develop materials and processes that support improved student learning strategies and achievement.			
Advisory Boards and State Teams	2	Needs Sensing	1995-2000
Chicago USI	2	Intensive Site	1995-2000
First In The World, IL	2	Intensive Site	1995-2000
School City of Hammond, IN	2	Intensive Site/Cross-lab project—Pathways, STRP High School (Online), Learning with Technology	1997-2000
Anderson, IN	2	Intensive Site	1997-2000
AEA 2, Clear Lake, IA	2	Intensive Site	1995-1998
Projects RISE and ISEE, IA	2	Intensive Site	1997-2000
Detroit USI, MI	2	Intensive Site	1995-2000
Michigan SSI	2	Intensive Sites	1995-1997
Project R.E.A.L. (Ohio—Appalachia area)	2	Intensive Site/Cross-lab project	1999-2000
Wisconsin Rapids, WI	2	Intensive Site	1997-2000
Objective 3: MSC will provide training and technical assistance to teachers, administrators, and other educators that will enable them to continuously improve teaching and learning in mathematics and science.			
The Learning Cooperative Challenge Grant (IL, IN, MI)	3	Technical Assistance	1995-1997
East St. Louis School District, IL	3	Technical Assistance	1998
Hawthorn-Irving School; Rock Island, IL	3	Technical Assistance	1998
District #152; Harvey, IL	3	Technical Assistance	1999-2000
District #60; Waukegan, IL	3	Technical Assistance	2000
Illinois State Board of Education Science Literacy Panel	3	Technical Assistance	2000
LaPorter County Professional Development Consortium, IN	3	Technical Assistance	1999
TIMSS Invitational Workshops, IN	3	Technical Assistance	1999

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Product/Service	Objective	Miscellaneous Notes	Timeline
Iowa Department of Education, IA	3	Technical Assistance	1997-1998
Iowa City Community Schools Science and Mathematics Review Team, IA	3	Technical Assistance	2000
Michigan Mathematics and Science Centers Network Professional Development Design Team, MI	3	Technical Assistance	1997-1998
Frame and Tapestry Learning Community, MI	3	Technical Assistance	1997-1998
Michigan Institute for Study of Leadership and Professional Development, MI	3	Technical assistance	1998-1999
Promising Academic Cost Effectively (PACE) Telecommunications Collaborative, MI	3	Technical assistance	1998-1999
Low Interim and Chronically Low Interim Schools Project, MI	3	Technical assistance	1998-1999
Grand Traverse Regional Math, Science and Tech Center, MI	3	Technical assistance	1998-2000
Michigan Rural Systemic Initiative (MiRSI)	3	Technical assistance	1998-2000
MiSMA, MI	3	Technical assistance	1999-2000
EDC Science Curriculum Center, MI	3	Technical Assistance	1999-2000
Minneapolis, MN	3	Technical Assistance	1995-1998
Minnesota Department of Education, MN	3	Technical Assistance	1997-1998
Columbus USI, OH	3	Technical Assistance	1995-1998
National Science Education Leadership Academy (WestEd), OH	3	Technical Assistance	1997-1998
Cleveland USI, OH	3	Technical Assistance	1997-2000
Project SMART; Cleveland, OH	3	Technical Assistance	1999
Milwaukee USI, WI	3	Technical Assistance	1997-1999
CESA #11, WI	3	Technical Assistance	1997-2000
Tomah, WI	3	Technical Assistance	1998
Conference Presentations (More than 100 have been conducted)	3	Presentations at National, State, Local Events	1995-2000
Objective 4: MSC will work through the National Organization Task Force on Informal Education, energy labs, museums, and other entities to promote the increased use of informal education entities.			
Fermilab Web-Based Curriculum Units	4	Product – Web-based	1995-1996
The Science Museum of Minnesota	4	N/A	1995-1996

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Product/Service	Objective	Miscellaneous Notes	Timeline
Informal Science Education Network	4	Product – Web-based	1995-1998
NCSA	4	Product-electronic	1995-2000
EnergyNet Advisory Board	4	Technical Assistance	1996-1997
Objective 5: Work with regional networks, consortia, and the Eisenhower National Clearinghouse to identify and describe exemplary resources and best instructional practices.			
Blueprints CD-ROM	5	CD-ROM—Cross Consortia Collaborative—guides experienced and aspiring developers to create effective professional development programs in curriculum/ instruction/assessment	1995-2000
MSC Web Sites	5	Web resource	1995-2000
Eisenhower National Clearinghouse Demonstration Site (ENC), Housed at the Lederman Science Center at Fermilab	5	Site for dissemination of math and science resource materials; provides professional development and technical assistance throughout our region	1995-2000
ENC Access Sites	5	Facilities throughout the region for the dissemination of math and science materials; providing professional development and technical assistance throughout our region	1998-2000
Best Practice Newsletter	5	Print Resource	1995-1997
Cross-Consortium Equity Task Force	5	Product—CD-ROM	1997-1999
Eisenhower National Clearinghouse (ENC) Advisory Board	5	Technical Assistance	1998-1999
Promising Practices	5	Print Resource	1996-1997

Product/Service	Objective	Miscellaneous Notes	Timeline
Objective 6: Collect data and evaluate programs to determine the effectiveness and impact of consortium activities in districts selected for intensive partnerships.			
Waukegan Challenge Grant	6	Evaluation	1995-2000
School City of Hammond	6	Intensive Site Evaluation	1997-2000
Wisconsin Rapids School District	6	Intensive Site Evaluation	1997-2000
Project REAL	6	Intensive Site Evaluation	1999-2000